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POWER IN OREGON

BY R. THOMAS SAWYER, '23

THE phantom dawn sprang forth glistening from peak to peak, spreading a scarlet touch across the cold, gray sky. A moment passed. Again it was dark, time to pause and wonder about our glorious West, and what splendors lay in the winding valleys far below. Then, the sun rose, another summer day awakened, and far away could be seen seven snow-capped peaks, and in the deep valleys below a small stream wound its way toward the sea thru a great forest of pines.

Man had watched that stream for many years; he had gaged its flow, saw its floods and drouths, and knew its curious ways. It was the Clackamas. Now, a mighty power plant is being built at Three Links on the Clackamas. This stream, tunneled thru the mountains, carried along the ridges with a great drop, will produce 100,000 horse power. Another great task has been started of harnessing the steady flowing mountain rivers of Oregon.

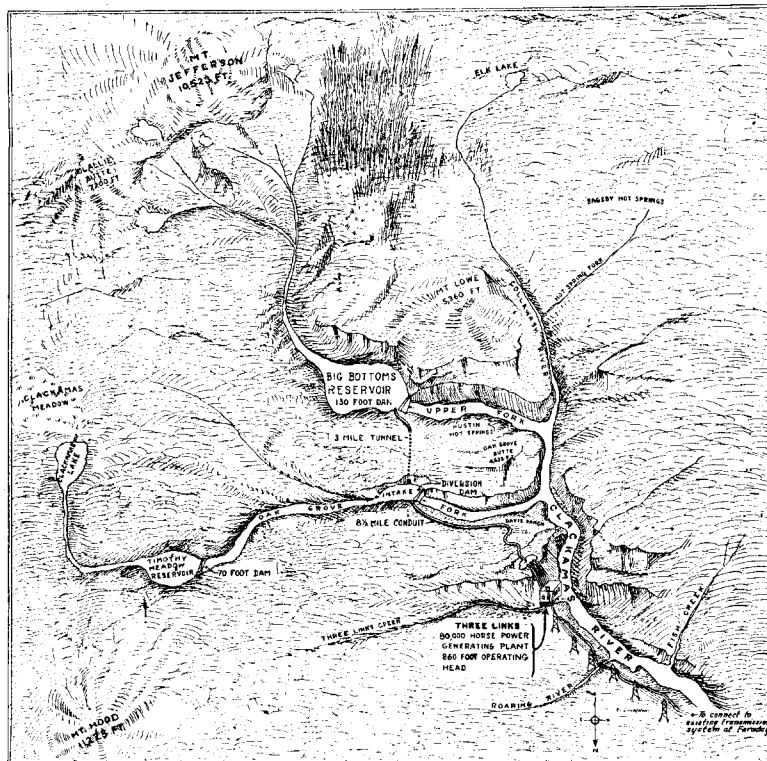
One afternoon I climbed to the rangers' station on top of Mt. Lowe. I looked thru the open door of the ranger's log cabin. I saw no one, but to my great surprise there stood a suit case, on the side of which was a pennant of scarlet and gray. It indeed said "Ohio State." That evening when Purdum, the ranger, an O. S. U. man, and I were chatting he went to the telephone and then asked me to listen in. There, in the glory of the sunset, as if by magic, over the wire came "Carmen Ohio." It was another Ohio State chap, who beautifully played his cornet from far across this valley of the Clackamas.

The power in Oregon lies in its rivers, its

mountain water falls. There is no coal in Oregon and a long haul to bring it makes it very expensive. Where electrical energy is produced in a steam plant the fuel used is oil or wood. Wood is used as the exclusive fuel in the large steam plants in Portland and many other parts of the state, yet oil is the chief steam-producing fuel in that section of the Northwest. Oil, as well as coal, must be imported, so the power in Oregon is produced in great abundance cheaply thru her streams and forests.

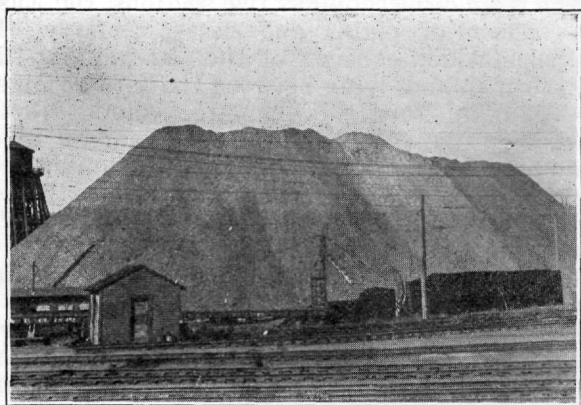
The state of Oregon has two sections, the Eastern section of plains and desert country, the Western, which consists of the Cascade and the Coast range and, lying between these two ranges, the beautiful, fertile Willamette Valley. Northward thru this valley winds the Willamette River and where it joins the mighty Columbia lies Portland, the key to Oregon and the Northwest. Around this thriving city are found the great power plants of that state.

Let us focus our thoughts upon one institution which is serving over one-half of the people in Oregon—the Portland Railway, Light and Power Company. The Portland Railway, Light and Power Company operates the street railways and some of the interurban lines in Portland and surrounding towns, as well as operating many large hydro and steam plants. The power plants down in the southern part of the Willamette Valley, up in the Cascade Range and in Portland are all tied together with a vast network of their transmission lines. The Clackamas River is the chief power producing stream for this company. Along this mountain river are two power plants,



Oak Grove Project

Casadero and River Mill. A third plant, a great hydraulic station, will soon be in operation. It is a gigantic enterprise, which will cost over ten million dollars to complete. The immediate capacity of the power house is one unit, which will deliver 34,000 horse power. The ultimate capacity was at first considered to be three 20,000 kilowatt units, but the plans were changed to use two units, each like the present one installed. At present serious consideration is being given to the future units and the next one may possibly be much larger. There is 100,000 horse power available and it is up to the skill of the engineer to use it the most economical way.



Sawdust for Steam Station "L."

This great new power plant, whose one unit will produce more power than the full capacity of the River Mill or the Casadero plant, is located about sixty miles southeast of Portland, or about twenty miles up the Clackamas from the Casadero plant at Faraday. One can note on the sketch of the country of this Oak Grove project, the location of the power plant at Three Links and the great system of reservoirs and piping used to deliver the water.

The Clackamas River above Faraday drains about 800 square miles of the western section of the Cascade range. Its main fork rises about 100 miles southeast of Portland, nearly forty miles from the power plant at Three Links. Running in a northerly direction from Mt. Jefferson and Olallie Butte, the main fork, increasing in volume, receives as its first tributary the waters of the Callowash, then the Oak Grove fork, and then runs in a northwestern direction until it empties into the Willamette several miles south of Portland. The territory of the upper end of the main fork is, in large part, dense forest, dotted here and there with sizeable lakes and marshes. The country is wild in the extreme and is studded with many minor peaks, ranging in altitude upward to 7200 feet.

The Oak Grove Branch rises in the Clackamas Lake on the summit of the Cascades about 18 miles south of Mt. Hood. The territory near the summit is largely composed of marsh and mountain meadows which soak up the winter precipitation and hold back the larger part of it, thus minimizing the winter floods of this branch of the Clackamas and augmenting the summer flow.

Now the waters of the Oak Grove branch are being developed. The dam at Intake, at the head

of the main conduit, is near completion. It is a small reinforced concrete dam, placed in a narrow, deep section of that branch. It is about 50 feet high and 150 feet long at the top, and built in an arc shape. Just above this dam the main steel conduit taps in. As soon as the first unit of the plant is turning over, drawing its water from the present little lake formed at intake, the Timothy Meadows reservoir will be started. Here a 70-foot earth dam will be constructed with a concrete spillway. An earth dam is very reliable, as well as inexpensive, where there are no appreciable floods. For the same reasons a 130-foot dam will be built at Big Bottoms, but this reservoir will not be started until the Oak Grove branch is completed.

A 130-foot earth dam is very large for that type of dam, but very permanent, due to the unique methods of construction, allowing the slopes to be gradual and all reinforced with heavy timber. [I have seen such dams in the Orient in perfect condition which are thousands of years old.] Much of the timber in that region is 6 to 10 feet in diameter and 200 feet tall. From Big Bottoms a three-mile steel conduit will be used and then a three-mile tunnel thru the mountain will deliver the water to Intake. This three-mile tunnel will be a large undertaking, as the mountains in this region are practically all solid rock. However, after it is built, its solid formation will be another everlasting monument to the great engineering feats of the Clackamas.

The steel conduit from Intake to Three Links power plant is eight and one-half miles long. Immediately upon leaving Intake the conduit tunnels through a hill for a short distance, but runs most of the way winding around the hills out in the open. Just above the power house the conduit pierces the very top of the hill. From the center of the top of this hill a large, vertical hole has been drilled to meet the conduit. In this hole a tall surge pipe with overflow will be placed. Out from the conduit in this hill a penstock carries the water to the power house in the valley far below, a drop of 860 feet vertically. This means that each cubic foot of water passing thru the penstock will, when applied to the generating unit, produce about 70 horse power.

The present unit of 34,000 horse power will soon be running, but the next unit will not be in operation until the Big Bottoms reservoir, with the three-mile supply tunnel to Intake, is completed. That will give them all of the energy available, 100,000 horse power, to the Three Links generating plant.

The design of the Three Links station is especially suited to the type of turbo generator used. It is of the vertical type and the floors and chambers in the building are placed so as to give a suitable air cooling circulation to the generator. The main floor is so located that only the top of the generator and its direct connected exciter extends up thru it. The water turbine is directly connected to the generator thru a special coupling and bearing. Rooms adjoining accommodate the office, control boards, switching apparatus and auxiliary equipment. All high tension transformers and switching equipment are located out doors in a yard beside the station. From this yard the

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One unit of hog fuel is 200 cubic feet or one cord of wood after it is pulverized. It costs one dollar a unit to handle from the mill to the boilers and, after paying about fifty cents a unit, its total cost is around one dollar and a half. One unit equals 4000 pounds and is equal to about one ton of 8000 B. T. U. coal. A chain conveyor pulls it above the boilers and there it is fed onto the grates in a constant stream. It is interesting to note that hog fuel produces less than one per cent of ash.

Thousands of units of hog fuel are used annually in many of the power plants in the Northwest, particularly there in Portland.

When any of us visit beautiful Oregon, possibly next year during the World's Fair, we might climb to the top of one of the peaks and view the abundance of power in the waterfalls and the forests. We might not hear "Carmen Ohio" as we stood in the splendor of the setting sun, reminding us of college days gone by, but rather the hum of "Three Links" gigantic station, an inspiration for our future profession.

POWER IN OREGON

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20-mile transmission line ties in with the old 57,000 volt line at the Casadera plant at Faraday.

This will certainly form a great link in the power system of Portland, Oregon, and the Willamette Valley. Thirty-four thousand horse power will give additional power needed for the supply lines of many of the great industries and thousands of homes of that state.

Rivers are the greatest source of producing power in Oregon, but the steam plants using wood must be spoken of, for they play a very important part. The largest steam plant in Portland, Station "L," uses wood as its only fuel. This plant has capacity of about 25,000 horse power. Station "L" is located next to a saw mill on the Willamette River in the center of the city. This mill is shut down in the winter months, but, in spite of that, it delivers all of the sawdust that Station "L" can use by making large storage piles, as shown in the accompanying photograph. This so called sawdust consists of all the refuse from the mill and, after being put thru a chopping or "hogging" machine, is commonly known as hog fuel.